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Technical Memorandum

To: Kevin Parrett, Project Manager (DEQ) -- McCormick and Baxter Superfund Site

Date: October 7, 2004

From: John Montgomery, Project Manager (E & E)

Subject: September 1, 2004 through September 24, 2004 Barrier Wall Performance Monitoring Monthly Report

1.0 Introduction

This technical memorandum presents a monthly status report on groundwater movement and nonaqueous phase liquid (NAPL) thickness results inside and outside the barrier wall at the McCormick and Baxter Creosoting Company, Portland Plant (McCormick and Baxter) site in Portland, Oregon. The technical memorandum presents hydraulic head measurements and gradients, groundwater contour maps, static water-level measurements, transducer plots, NAPL gauging and extraction results. The monitoring data was collected during the period from September 1, 2004 through September 24, 2004. Tables and figures are attached at the end of this technical memorandum.

The monitoring program at the McCormick and Baxter site is used to evaluate the functional performance of the containment system (the barrier wall) and to determine whether the containment system is performing the designed function. The purpose of this report is to provide data in support of the objectives and goals as defined in the monitoring plan. These include:

- Understand changes in groundwater flow outside and inside the barrier containment system;

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- Understand changes in gradients/fluxes from the bluff to the river on the north and south sides of the containment system;

- Understand groundwater flow and contaminant movement along the riverfront downgradient of the containment system;

- Determine the effects of groundwater flow toward Willamette Cove in relation to existing NAPL seeps; and

- Determine the effects of river stage and tidal influence on groundwater levels and flow.

2.0 Water-Level Monitoring

Automated and Manual Water-Level Data Collection

Groundwater level data is currently being collected at the site from select monitoring wells using automated pressure transducers and manually operated electronic water-level indicators.

Approximately 90 monitoring wells were manually monitored during the reporting period to determine groundwater elevations and calculate gradients inside and outside the barrier wall. Twenty-four select monitoring wells are equipped with pressure transducers to collect water-level measurements at hourly intervals (Table 1). Due to upcoming well modifications on select wells, E & E removed transducers from those wells located along the riverfront on September 24, 2004. The transducers will be replaced upon the completion of well modifications. Data from the remaining transducers will continue to be downloaded at monthly intervals using a hand-held personal digital assistant or PDA.

On September 23, 2004 groundwater-level data was collected manually from 89 on-site wells and one off site well at low tide. Gauging began approximately 1 hour before low tide and was completed within 1 hour after low tide (e.g. during the tidal period that has the minimal water level change). The resultant data (Table 2) was used to construct a groundwater contour map and is provided as Figures 2a and 2b of this report.

The monitoring wells designated with an *s* (e.g., MW-36s) are wells screened in the shallow zone. Those wells designated with an *i* (e.g., MW-36i) are screened in the intermediate zone, and those wells designated with a *d* (e.g., MW-36d) are screened in the deep zone. Deep monitoring wells are screened beneath the base of the barrier wall. Figure 1 shows the locations of the monitoring well network.

River stage data are recorded daily from the Morrison Bridge and corrected to river stage adjacent to the McCormick and Baxter site [(Morrison Bridge data)-(0.1 ft)].

2.1 Groundwater Flow and Gradients

Figures 2a and 2b present groundwater contour maps representing conditions during low tide on September 23, 2004. Groundwater inside the wall continues to generally flow toward the FWDA. Horizontal gradients were calculated using both the contour

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toward the FWDA. Horizontal gradients were calculated using both the contour elevations and the well groundwater elevations inside the barrier wall (see Figure 2a). The calculated horizontal gradient inside the wall for the current monitoring event is 0.001 ft/ft in the TFA and 0.011 ft/ft in the FWDA. Horizontal gradients were calculated for several different areas on site both inside and outside of the barrier wall, and are listed in Table 3. Groundwater outside the wall is diverted around the upland portion of the wall toward Willamette Cove and toward the southeastern portion of the site. In the FWDA, heads inside the wall were approximately 4.5 feet higher than heads outside the wall. In the TFA, heads inside the wall were approximately 6 feet higher than heads outside the wall. No significant changes were observed between August and September 2004.

Vertical groundwater gradients were calculated using manual and transducer data from September 23, 2004 for several of the nested wells installed inside and outside the barrier wall. Table 4 presents the calculated vertical gradients between the shallow, intermediate and deep aquifer zones during low tide. Vertical gradients at low tide are generally down inside and outside of the wall in both the FWDA (wells 36, 37, 40, 41) and the TFA (44 and 45).

2.2 Transducer Plots

Transducer plots were developed for select monitoring wells (MW-36s, MW-37s, MW-44s and MW-45s) inside and outside the barrier wall during the reporting period (Figures 4 and 5, respectively). The shallow aquifer plots compare monthly water-level elevations inside the barrier wall versus water-level elevations outside the barrier wall, river elevation, and precipitation data. Water levels outside the wall correlate well with river stage along the riverfront portion of the barrier wall. Water levels in shallow wells located inside the wall in the FWDA and the TFA appeared to be declining.

3.0 NAPL Thickness and Extraction

Light non-aqueous phase liquid (LNAPL) and dense non-aqueous liquid (DNAPL) measurements were recorded at several site wells during the reporting period. Currently, 28 monitoring wells in the TFA and the FWDA are measured for NAPL thickness on a weekly basis. When LNAPL exceeding 0.4 ft thickness is encountered during routine monitoring, it is manually extracted using passive skimmers or bailers. When DNAPL exceeding 1.5 ft thickness is encountered during monitoring, it is extracted using pneumatic pumps.

In response to increased DNAPL volumes, E & E installed a temporary DNAPL extraction system on August 27th, 2004 to extract DNAPL from monitoring wells MW-Ds, MW-20i, EW-9s, MW-Gs, and EW-2s. The system was installed in an effort to increase the volume of DNAPL extracted. The system is constructed largely from existing equipment utilized in the previous groundwater extraction system. The system is composed of dedicated pneumatic pumps in each of the wells listed above which are powered by an existing air compressor. A separate pump controller individually controls each pump. Individual pumping rates are established based on the DNAPL thickness in the well, which is measured daily. Pumping durations are based on visual observation of extracted product (e.g. the presence of water in the discharge). An automatic timer has

been installed on the air compressor to prevent continuous pumping of the wells. This was added as a safety feature to reduce the volume of water extracted and to prevent potential overflow of the storage drums. For example, the timer prevents the system from operating overnight, if the system is not shut down manually each day. Extracted DNAPL is stored in well specific 55-gallon drums located in an existing containment area. Discharge hoses are securely connected to individual drums using quick connect fittings. DNAPL thickness is measured each morning before the system is turned on. Extracted DNAPL and water volumes for individual wells are calculated on a weekly basis.

Clean wells (wells not containing NAPL) are gauged on a monthly basis for water levels and total depths, and to verify that NAPL has not infiltrated these wells. Figure 2 shows the locations of monitoring wells that have exhibited measurable thicknesses of LNAPL and/or DNAPL during September 2004.

LNAPL

The measured LNAPL thicknesses ranged from 0.01 feet to 2.36 feet in on-site wells. Ten wells in the FWDA, four wells in the TFA, and one well near the shop exhibited measurable thicknesses of LNAPL during this reporting period (Table 5). Six of these exhibited a thicknesses of 0.05 feet or less. LNAPL thicknesses measured in September 2004 were generally consistent with thicknesses measured in previous months.

DNAPL

Measurable DNAPL was recorded in eleven wells during the reporting period. The measured DNAPL thicknesses ranged from 0.32 feet to 3.10 feet in on site wells. Six wells in the FWDA, four wells in the TFA, and one well located near the shop building contained DNAPL during this reporting period (Table 5). DNAPL thickness has continued to decrease in monitoring wells MW-20i and MW-Ds due to increased extraction rates.

NAPL Extraction

A total of 63.27 gallons of LNAPL was manually extracted during the reporting period using disposable bailers. A total of 35.12 gallons of DNAPL was extracted using pneumatic pumps during the reporting period. A total of 32.84 gallons of DNAPL was extracted using the automated extraction system during the reporting period. The quantity of DNAPL extracted using the automated system has steadily decreased during the reporting period.

During extraction, a certain percentage of groundwater is also removed as part of the extraction process. E & E has observed that the quantity of groundwater has been steadily increasing with each reporting period during DNAPL extraction. The increased percentage of water may be due to decreasing thickness and the use of the automated extraction system. Table 5 lists the NAPL thickness and extracted values (corrected for percentage of water) recorded for individual wells during this reporting period.

3.1 Seep Visual Inspection and Monitoring

Visual inspections of seep areas were not conducted during the reporting period due to current construction activities. Visual inspections will not be conducted during construction activities but will continue following the completion of the sediment cap installation.

4.0 Summary Observations

Shallow aquifer water levels on the inside of the wall located in the TFA are typically higher than shallow water levels on the inside of the wall located in the FWDA. Flow is generally from the TFA to the FWDA. This is consistent with previous monitoring periods. Water level elevations within the barrier wall are slowly decreasing, which we would expect to observe during the summer season. Water levels will continue to be monitored and reported on a monthly basis.

NAPL monitoring and extraction will continue on a weekly basis, and patterns of NAPL appearance and rebound will be noted and used to optimize removal activities. Thickness and extracted quantity has decreased in DNAPL extraction system wells. Observed NAPL thicknesses and occurrence during the reporting period were fairly consistent with the previous reporting period with the exception of those wells on the extraction system.

Table 1
Monitoring Well Network
McCormick and Baxter Creosoting Company Site
Portland, Oregon

Well Identification	Monitoring Frequency	Measurement Method	Screen Interval (feet NGVD)
Existing Wells			
EW-1s	Weekly	Manual/NAPL Gauge	14.11 to -10.89
EW-2s	Weekly	Manual/NAPL Gauge	17.06 to -7.94
EW-5s	Weekly	Manual/NAPL Gauge	5.98 to -4.02
EW-8s	Weekly	Manual/NAPL Gauge	4.76 to -15.24
EW-9s	Weekly	Manual/NAPL Gauge	3.51 to -6.49
EW-10s	Weekly	Manual/NAPL Gauge	5.61 to -14.39
EW-12s	Weekly	Manual/NAPL Gauge	18.06 to -1.94
EW-14R	Weekly	Manual/NAPL Gauge	-15.00 to -35.00
EW-15s	Weekly	Manual/NAPL Gauge	12.92 to -7.08
EW-16R	Weekly	Manual/NAPL Gauge	12.68 to -7.32
EW-17s	Weekly	Manual/NAPL Gauge	13.04 to -6.96
EW-18s	Weekly	Manual/NAPL Gauge	14.74 to -5.26
EW-19s	Weekly	Manual/NAPL Gauge	*9.64 to -9.5*
EW-22s	Weekly	Manual/NAPL Gauge	16.51 to -3.49
EW-23s	Weekly	Manual/NAPL Gauge	13.30 to -6.70
EW-24s	Weekly	Manual/NAPL Gauge	15.49 to -4.51
MW-20i	Weekly	Manual/NAPL Gauge	-15.50to -35.50
MW-34i	Weekly	Manual/NAPL Gauge	-33.93 to -53.93
MW-36d	Hourly	Pressure Transducer	-55.2 to -60.20
MW-36i	Hourly	Pressure Transducer	-21.1141 to -26.11
MW-36s	Hourly	Pressure Transducer	13.75 to -1.25
MW-37d	Hourly	Pressure Transducer	-55.26 to -60.26
MW-37i	Hourly	Pressure Transducer	-20.17 to -25.17
MW-37s	Hourly	Pressure Transducer	8.01 to -6.99
MW-40d	Hourly	Pressure Transducer	-54.51 to -59.51
MW-40i	Hourly	Pressure Transducer	-20.42 to -25.42
MW-40s	Hourly	Pressure Transducer	13.61 to -1.39
MW-41d	Hourly	Pressure Transducer	-55.84 to -60.84
MW-41i	Hourly	Pressure Transducer	-21.80 to -26.80
MW-41s	Hourly	Pressure Transducer	12.44 to -2.56
MW-44d	Hourly	Pressure Transducer	-55.54 to -60.54
MW-44i	Hourly	Pressure Transducer	-20.64 to -25.64
MW-44s	Hourly	Pressure Transducer	12.59 to -2.41
MW-45d	Hourly	Pressure Transducer	-56.54 to -61.54
MW-45i	Hourly	Pressure Transducer	-20.51 to -25.51
MW-45s	Hourly	Pressure Transducer	11.95 to-3.05
MW-50s	Hourly	Pressure Transducer	15.87 to 0.87
MW-51s	Hourly	Pressure Transducer	16.42 to 1.42
MW-54s	Hourly	Pressure Transducer	17.53 to 2.53
MW-55s	Hourly	Pressure Transducer	17.26 to 2.26
MW-56s	Weekly	Manual/NAPL Gauge	18.17 to 3.17
MW-58d	Hourly	Pressure Transducer	-46.39 to -51.59
MW-58s	Hourly	Pressure Transducer	17.79 to 2.79
MW-Ds	Weekly	Manual/NAPL Gauge	7.34 to 2.34
MW-Es	Weekly	Manual/NAPL Gauge	16.85 to -3.15
MW-Gs	Weekly	Manual/NAPL Gauge	14.05 to -5.95
MW-Ni	Weekly	Manual/NAPL Gauge	-22.48 to -33.48
MW-Rs	Weekly	Manual/NAPL Gauge	16.30 to 1.30
EW-25s	Low Tide Event	Manual	20.90 to .90

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Well Identification	Monitoring Frequency	Measurement Method	Screen Interval (feet NGVD)
MW-10s	Low Tide Event	Manual	18.17 to -1.83
MW-11s	Low Tide Event	Manual	16.62 tp -3.38
MW-14s	Low Tide Event	Manual	14.83 to -5.17
MW-15s	Low Tide Event	Manual	22.56 to 2.56
MW-17s	Low Tide Event	Manual	18.75 to -1.25
MW-18s	Low Tide Event	Manual	14.26 to -5.74
MW-1s	Low Tide Event	Manual	8.66 to -11.34
MW-22i	Low Tide Event	Manual	-9.84 to -19.84
MW-23d	Low Tide Event	Manual	- 139.72 to -149.72
MW-2s	Low Tide Event	Manual	17.73 to -2.27
MW-32i	Low Tide Event	Manual	-14.70 to -24.70
MW-33s	Low Tide Event	Manual	13.95 to 3.95
MW-35s	Low Tide Event	Manual	9.74 to -10.26
MW-38d	Low Tide Event	Manual	-54.75 to -59.75
MW-38i	Low Tide Event	Manual	-19.76 to -24.76
MW-38s	Low Tide Event	Manual	13.11 to -1.89
MW-39d	Low Tide Event	Manual	-55.22 to -60.22
MW-39i	Low Tide Event	Manual	-20.49 to -25.49
MW-39s	Low Tide Event	Manual	12.15 to -2.85
MW-3s	Low Tide Event	Manual	17.36 to -2.64
MW-42d	Low Tide Event	Manual	-54.63 to -59.63
MW-42i	Low Tide Event	Manual	-19.15 to -24.15
MW-42s	Low Tide Event	Manual	17.40 to 2.40
MW-43d	Low Tide Event	Manual	-55.4 to -60.40
MW-43i	Low Tide Event	Manual	-20.32 to -25.32
MW-43s	Low Tide Event	Manual	16.12 to 1.12
MW-46s	Low Tide Event	Manual	15.88 to 0.88
MW-47s	Low Tide Event	Manual	16.48 to 1.48
MW-48s	Low Tide Event	Manual	14.60 to -0.40
MW-49s	Low Tide Event	Manual	13.91 to -1.09
MW-52s	Low Tide Event	Manual	11.75 to -3.25
MW-53s	Low Tide Event	Manual	11.62 to -3.38
MW-57s	Low Tide Event	Manual	17.97 to 2.97
MW-58i	Low Tide Event	Manual	-12.14 to -17.14
MW-5s	Low Tide Event	Manual	22.03 to 2.03
MW-7s	Low Tide Event	Manual	15.31 to -4.69
MW-7-WC	Low Tide Event	Manual	11.46 to -3.54
MW-8i	Low Tide Event	Manual	-10.45 to -30.45
MW-As	Low Tide Event	Manual	11.70 to 6.70
MW-Cs	Low Tide Event	Manual	13.96 to 8.96
MW-Is	Low Tide Event	Manual	18.17 to -1.83
MW-Js	Low Tide Event	Manual	19.95 to -0.05
MW-Ks	Low Tide Event	Manual	20.50 to 0.50
MW-LRs	Low Tide Event	Manual	17.87 to -2.03
MW-Os	Low Tide Event	Manual	20.12 to -1.88
PW-1d	Low Tide Event	Manual	-31.60 to -90.60
PW-2d	Low Tide Event	Manual	-31.96 to -51.96

Notes:
italic text = approximate value

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Table 2
GROUNDWATER AND LNAPL ELEVATIONS
September 23, 2004
McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

Well ID	Time	Measuring Point Elevation (ft NGVD)	Measuring Point	Depth to LNAPL (ft)	LNAPL Elevation (ft NGVD)	LNAPL Thickness	Depth to water (feet)	GW Elevation (ft NGVD)	GW Elevation (ft NGVD) LNAPL corrected	Specific Gravity of NAPL
EW-10s	10:52	22.90	IC	19.11	3.79	0.60	19.71	3.19	3.78	0.98135
EW-12s	12:00	34.19	IC				23.55	10.64		
EW-14R	11:15	36.35	IC				28.42	7.93		
EW-15s	11:23	37.70	IC	29.87	7.83	1.31	31.18	6.52	7.82	0.9887
EW-16R	11:27	36.75	OC				28.51	8.24		
EW-17s	11:46	34.91	IC	24.44	10.47	0.10	24.54	10.37	10.47	0.98135
EW-18s	11:44	35.42	IC	25.02	10.40	0.55	25.57	9.85	10.39	0.974
EW-19s	10:47	19.29	IC				14.61	4.68		
EW-1s	11:52	32.88	IC	22.16	10.72	0.01	22.17	10.71	10.72	0.98135
EW-22s	11:13	38.48	IC				33.22	5.26		
EW-23s	11:18	35.18	IC	28.01	7.17	0.86	28.87	6.31	7.15	0.98135
EW-24s	11:36	35.04	IC				24.61	10.43		
EW-2s	11:05	35.19	IC	30.07	5.12	0.02	30.09	5.10	5.12	0.98135
EW-5s	11:49	33.66	OC				23.01	10.65		
EW-8s	11:40	34.74	OC				24.24	10.50		
EW-9s	11:10	37.38	IC				32.29	5.09		
MW-20i	11:02	35.03	OC	31.97	3.06	0.01	31.98	3.05	3.06	0.98135
MW-34i	10:55	23.62	IC				20.52	3.10		
MW-56s	11:33	36.42	IC	28.07	8.35	0.38	28.45	7.97	8.34	0.98135
MW-Ds	11:07	37.60	OC	32.36	5.24	0.01	32.37	5.23	5.24	0.98135
MW-Es	11:30	37.72	IC	29.56	8.16	0.38	29.94	7.78	8.15	0.98135
MW-Gs	10:58	32.69	IC	27.81	4.88	0.22	28.03	4.66	4.88	0.98135
MW-Is	11:56	33.14	IC				22.4	10.74	10.74	
MW-Rs	11:36	32.98	IC	22.68	10.30	0.19	22.87	10.11	10.30	0.98135
MW-58s	10:43	38.06	IC				33.24	4.82		
MW-58i	10:44	37.54	IC				33.85	3.69		
MW-58d	10:46	37.98	IC				34.9	3.08		
MW-7 WC	10:57	33.28	IC				26.79	6.49		
MW-18s	11:09	39.75	IC				34.52	5.23		
MW-57s	11:12	36.36	IC				30.84	5.52		
MW-15s	11:16	34.87	IC				24.68	10.19		
MW-17s	11:20	34.58	OC				24.9	9.68		
MW-46s	11:28	34.20	IC				23.58	10.62		
MW-47s	11:30	34.74	IC				29.68	5.06		
MW-5s	11:35	31.66	IC				19	12.66		
MW-23d	11:40	32.73	IC				29.17	3.56		
MW-22i	11:47	33.85	IC				29.98	3.87		
MW-10s	11:50	33.91	IC				23.07	10.84		
MW-11s	11:56	33.52	IC				22.75	10.77		
MW-Cs	12:00	36.29	IC				25.95	10.34		
MW-14s	12:04	33.47	IC				23.42	10.05		
MW-54s	12:07	35.85	IC				25.61	10.24		
MW-55s	12:09	35.57	IC				27.53	8.04		
MW-33s	12:12	35.57	IC				27	8.57		
MW-Js	12:17	35.42	IC				24.95	10.47		
MW-52s	12:20	35.09	IC				24.69	10.40		
MW-53s	12:22	35.12	IC				24.08	11.04		
MW-50s	12:26	34.26	IC				23.06	11.20		
MW-51s	12:27	34.71	IC				22.75	11.96		
PW-2d	12:30	35.85	IC				29.18	6.67		
MW-Os	12:34	34.61	IC				22.48	12.13		
PW-1d	12:37	36.26	IC				29.62	6.64		
MW-As	12:44	34.76	IC				22.49	12.27		
MW-Ks	12:49	36.51	IC				28.38	8.13		
MW-36s	10:45	23.57	IC				16.24	7.33		
MW-36i	10:46	22.59	IC				19.27	3.32		
MW-36d	10:48	22.31	IC				19.2	3.11		
MW-37s	10:49	17.75	IC				13.49	4.26		
MW-37i	10:51	17.51	IC				14.4	3.11		
MW-37d	10:54	17.28	IC				14.25	3.03		
MW-38s	10:57	23.04	IC				15.03	8.01		
MW-38i	10:58	23.06	IC				19.53	3.53		
MW-38d	10:59	22.90	IC				19.73	3.17		
MW-39s	11:01	22.02	IC				17.54	4.48		
MW-39i	11:02	22.39	IC				19.27	3.12		
MW-39d	11:03	22.55	IC				19.42	3.13		
MW-40s	11:05	23.40	IC				14.4	9.00		
MW-40i	11:06	23.24	IC				19.66	3.58		
MW-40d	11:08	23.08	IC				19.88	3.20		
MW-41s	11:09	22.26	IC				17.63	4.63		
MW-41i	11:10	22.04	IC				18.65	3.39		
MW-41d	11:11	22.05	IC				18.87	3.18		

Table 2
GROUNDWATER AND LNAPL ELEVATIONS
September 23, 2004
McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

MW-42s	11:16	35.02	IC				25.12	9.90		
MW-42i	11:18	35.04	IC				31.7	3.34		
MW-42d	11:19	35.02	IC				31.74	3.28		
MW-LRs	11:21	33.93	IC				23.56	10.37		
MW-7s	11:25	32.56	IC				22.08	10.48		
MW-8i	11:26	32.09	IC				28.26	3.83		
MW-44s	11:28	23.07	IC				12.55	10.52		
MW-44i	11:29	23.19	IC				19.13	4.06		
MW-44d	11:30	22.91	IC				19.57	3.34		
MW-45s	11:32	22.43	IC				17.83	4.60		
MW-45i	11:35	22.07	IC				18.25	3.82		
MW-45d	11:33	21.93	IC				18.59	3.34		
MW-3s	11:41	27.20	IC				16.38	10.82		
EW-25s	11:53	33.19	IC				22.38	10.81		
MW-48s	11:51	33.02	IC				21.41	11.61		
MW-49s	11:49	32.19	IC				19.84	12.35		
MW-2s	11:45	31.59	IC				24.54	7.05		

Table 3

GROUNDWATER ELEVATION GRADIENTS
McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

Well ID	Date	Horizontal Distance (ft)	Horizontal Gradient (ft/ft)
Inside Barrier Wall			
MW-50s to MW-36s	9/23/2004 (Low Tide)	1090.4	0.004
TFA Monitoring Wells			
11' to 10' Contour	9/23/2004 (Low Tide)	660.0	0.001
FWDA Monitoring Wells			
MW-15s to MW-36s	9/23/2004 (Low Tide)	400.4	0.007
10' to 8' Contour	9/23/2004 (Low Tide)	187.5	0.011
Outside Barrier Wall			
MW-45s to River[1]	9/23/2004 (Low Tide)	75.0	0.025
FWDA Monitoring Wells			
MW-57s to MW-58s	9/23/2004 (Low Tide)	300.0	0.002

Note:

[1] The distance from the Willamette River to the well is the corresponding ground surface elevation for the river stage at low tide (2.74 NGVD), perpendicular from MW-45s to the river.

Key:

ft = Feet.
ft/ft = Feet per foot.
FWDA = Former waste disposal area.
TFA = Tank farm area.

Table 4
VERTICAL GROUNDWATER ELEVATION GRADIENTS
9/23/2004 at low tide
McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

Well ID	Manual Measurements Mid-point value (ft/ft)	Transducer Measurements Mid-point value (ft/ft)	Direction	Well ID	Manual Measurement Times	Transducer Measurement Times
MW-36s to MW-36d	0.070	0.070	down	MW-36d	10:48	11:19
MW-36s to MW-36i	0.151	0.153	down	MW-36i	10:46	11:25
MW-36i to MW-36d	0.006	0.005	down	MW-36s	10:45	11:13
				MW-37d	10:54	10:38
MW-37s to MW-37d	0.022	0.021	down	MW-37i	10:51	11:25
MW-37s to MW-37i	0.054	0.051	down	MW-37s	10:49	11:22
MW-37i to MW-37d	0.002	0.003	down	MW-40d	11:08	10:38
				MW-40i	11:06	10:50
MW-40s to MW-40d	0.095	0.097	down	MW-40s	11:05	11:32
MW-40s to MW-40i	0.203	0.196	down	MW-41d	11:11	10:50
MW-40i to MW-40d	0.011	0.018	down	MW-41i	11:10	11:45
				MW-41s	11:09	11:03
MW-41s to MW-41d	0.024	0.020	down	MW-44d	11:30	11:11
MW-41s to MW-41i	0.049	0.053	down	MW-44i	11:29	11:58
MW-41i to MW-41d	0.006	0.004	down; up	MW-44s	11:28	11:01
				MW-45d	11:33	11:14
MW-44s to MW-44d	0.116	0.116	down	MW-45i	11:35	12:09
MW-44s to MW-44i	0.238	0.241	down	MW-45s	11:32	11:02
MW-44i to MW-44d	0.021	0.019	down			
MW-45s to MW-45d	0.021	0.022	down			
MW-45s to MW-45i	0.033	0.038	down			
MW-45i to MW-45d	0.013	0.011	down			

Note: Gradients calculated using EPA vertical gradient calculator.
http://www.epa.gov/athens/learn2model/part-two/onsite/vgradient02.htm

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Table 5
LNAPL and DNAPL Measurement Summary
August 30 through September 24, 2004

Date Measured	Well Number	Measured Thickness (feet)	Extracted (Gallons)
LNAPL			
8/30/04	EW-10s	1.04	3.79
9/7/04	EW-10s	2.6	3.79
9/14/04	EW-10s	0.82	3.03
9/20/04	EW-10s	0.89	3.03
9/7/04	EW-12s	1.01	0.00
8/30/04	EW-15s	1.71	2.66
9/7/04	EW-15s	2.36	3.79
9/14/04	EW-15s	1.83	3.79
9/20/04	EW-15s	1.8	3.79
9/14/04	EW-17s	0.02	0.00
9/20/04	EW-17s	0.04	0.00
8/30/04	EW-18s	1.13	4.50
9/8/04	EW-18s	2.2	0.00
9/14/04	EW-18s	1.09	9.00
9/20/04	EW-18s	0.89	0.00
9/7/04	EW-19s	0.01	0.00
8/30/04	EW-23s	1.17	3.39
9/7/04	EW-23s	1.7	4.24
9/14/04	EW-23s	1.45	4.24
9/20/04	EW-23s	1.09	4.24
9/2/04	EW-2s	0.01	0.00
9/3/04	EW-2s	0.02	0.00
9/7/04	EW-2s	0.01	0.00
9/10/04	EW-2s	0.01	0.00
9/14/04	EW-2s	0.01	0.00
9/16/04	EW-2s	0.01	0.00
9/17/04	EW-2s	0.01	0.00
9/20/04	EW-2s	0.01	0.00
9/21/04	EW-2s	0.01	0.00
9/2/04	MW-20i	0.01	0.00
9/7/04	MW-20i	0.01	0.00
9/8/04	MW-20i	0.01	0.00
9/20/04	MW-20i	0.01	0.00
9/21/04	MW-20i	0.02	0.00
9/7/04	MW-56s	0.26	0.00
9/14/04	MW-56s	0.44	1.35
9/20/04	MW-56s	0.46	1.35
9/1/04	MW-Ds	0.01	0.00
9/7/04	MW-Ds	0.02	0.00
9/8/04	MW-Ds	0.01	0.00
9/10/04	MW-Ds	0.01	0.00
9/15/04	MW-Ds	0.01	0.00
9/17/04	MW-Ds	0.01	0.00
9/21/04	MW-Ds	0.02	0.00

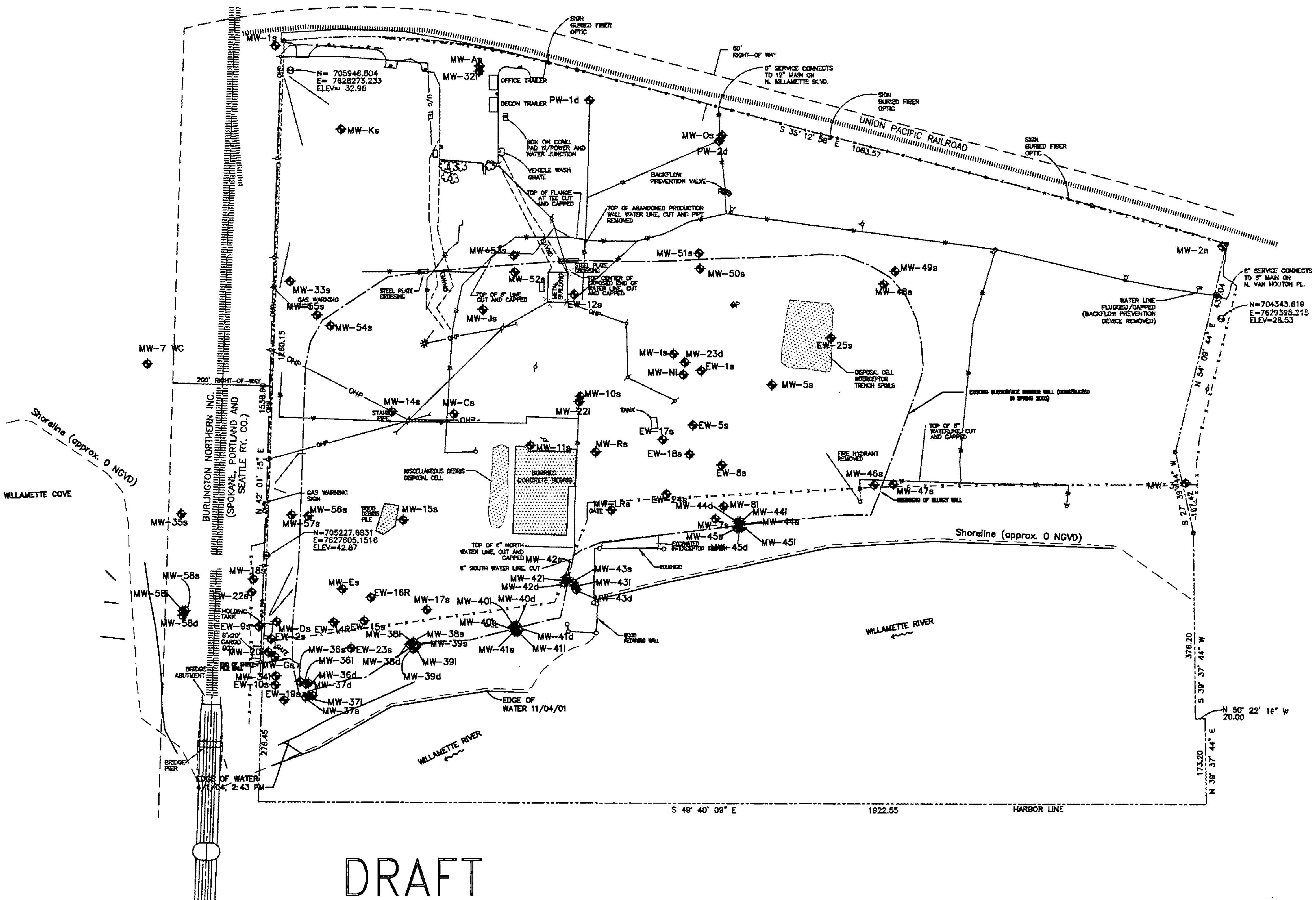
Table 5
LNAPL and DNAPL Measurement Summary
August 30 through September 24, 2004

Date Measured	Well Number	Measured Thickness (feet)	Extracted (Gallons)
8/30/04	MW-Es	0.85	0.73
9/7/04	MW-Es	0.71	0.73
9/14/04	MW-Es	0.78	0.73
9/20/04	MW-Es	0.83	1.10
9/1/04	MW-Gs	0.06	0.00
9/2/04	MW-Gs	0.02	0.00
9/3/04	MW-Gs	0.06	0.00
9/7/04	MW-Gs	0.04	0.00
9/8/04	MW-Gs	0.35	0.00
9/9/04	MW-Gs	0.61	0.00
9/10/04	MW-Gs	0.02	0.00
9/14/04	MW-Gs	0.02	0.00
9/15/04	MW-Gs	0.01	0.00
9/16/04	MW-Gs	0.02	0.00
9/17/04	MW-Gs	0.03	0.00
9/20/04	MW-Gs	0.04	0.00
9/21/04	MW-Gs	0.14	0.00
9/7/04	MW-Is	0.02	0.00
9/8/04	MW-Rs	0.13	0.00
9/14/04	MW-Rs	0.08	0.00
9/20/04	MW-Rs	0.21	0.00
DNAPL			
8/30/04	EW-12s	1.04	2.48
9/7/04	EW-12s	0.61	0.00
9/14/04	EW-12s	0.51	0.00
9/20/04	EW-12s	0.55	0.00
8/30/04	EW-1s	1.12	5.58
9/14/04	EW-1s	1.14	3.72
9/20/04	EW-1s	1.16	3.72
9/7/04	EW-23s	0.32	0.00
9/8/04	EW-24s	0.44	0.00
9/14/04	EW-24s	0.77	0.00
9/20/04	EW-24s	0.66	0.00
8/30/04	MW-Is	1.73	2.17
9/7/04	MW-Is	2.13	1.86
9/14/04	MW-Is	1.19	0.00
9/16/04	MW-Is	0	2.17
9/20/04	MW-Is	1.05	1.86
8/30/04	EW-8s	1.11	5.29
9/8/04	EW-8s	1.38	0.00
9/14/04	EW-8s	1.09	0.00
9/16/04	EW-8s	0	3.31
9/20/04	EW-8s	1.07	2.98

Table 5
LNAPL and DNAPL Measurement Summary
August 30 through September 24, 2004

Date Measured	Well Number	Measured Thickness (feet)	Extracted (Gallons)
DNAPL Extraction System Wells			
9/1/04	EW-9s	0.53	0.00
9/1/2004 - 9/3/04	MW-20i	0.38 - 1.29	0.56
9/7/2004 - 9/10/04	MW-20i	0.86 - 1.72	5.16
9/14/2004 - 9/17/04	MW-20i	0.45 - 0.76	0.0 - 1.0
9/20/2004 -9/24/02	MW-20i	0.81 - 0.82	0.41
9/1/2004 - 9/3/04	MW-Ds	0.89 - 1.52	0.71
9/7/2004 - 9/10/04	MW-Ds	1.02 - 1.9	0.00
9/14/2004 - 9/17/04	MW-Ds	0.96 - 2.06	0.41
9/20/2004 - 9/24/04	MW-Ds	0.77 - 0.9	0.83
9/1/2004 - 9/3/04	MW-Gs	0.88 - 3.1	5.46
9/7/2004 - 9/10/04	MW-Gs	0.64 - 0.94	6.61
9/14/2004 - 9/17/04	MW-Gs	0.57 - 1.93	1.65
9/20/2004 -9/24/02	MW-Gs	0.8 - 1.87	8.06
9/1/2004 - 9/3/04	EW-2s	0.81 - 1.06	0.12
9/7/2004 - 9/10/04	EW-2s	0.72 - 1.12	1.24
9/14/2004 - 9/17/04	EW-2s	0.7 - 0.9	0.21
9/20/2004 - 9/24/04	EW-2s	0.72 - 0.94	0.41

Note: Extraction volumes are calculated based on weekly cumulative amounts.
Negative extraction volumes represent the effect of phase separation in the drum after extraction and between times of measurement.


UNION PACIFIC RAILROAD
S 35° 12' 58" E 1083.57
BURLINGTON NORTHERN INC. (SPOKANE, PORTLAND AND SEATTLE RY. CO.)
200' RIGHT-OF-WAY
60' RIGHT-OF-WAY
N 42° 01' 15" E
Shoreline (approx. 0 NGVD)
WILLAMETTE COVE
WILLAMETTE RIVER
S 49° 40' 09" E
1922.55
HARBOR LINE
N 54° 09' 44" E
S 27° 39' 44" W
S 39° 37' 44" W
N 39° 37' 44" E
N 50° 22' 16" W
EDGE OF WATER 11/04/01
N= 705946.804
E= 7628273.233
ELEV= 32.96
N=705227.6831
E=7627605.1516
ELEV=42.87
N=704343.619
E=7629395.215
ELEV=28.53
OFFICE TRAILER
DECON TRAILER
BURIED CONCRETE DEBRIS
MISCELLANEOUS DEBRIS DISPOSAL CELL
DISPOSAL CELL INTERCEPTOR TRENCH SPOILS
BACKFLOW PREVENTION VALVE
FIRE HYDRANT REMOVED
MW-1s
MW-Ks
MW-33s
MW-55s
MW-54s
MW-7 WC
MW-35s
MW-58s
MW-58d
MW-14s
MW-Cs
MW-10s
MW-22i
MW-11s
MW-Rs
MW-15s
MW-56s
MW-57s
MW-Es
EW-16R
MW-17s
MW-40i
MW-40d
MW-41s
MW-41d
MW-41i
MW-42s
MW-42i
MW-42d
MW-43s
MW-43i
MW-43d
MW-44d
MW-44i
MW-44s
MW-45s
MW-45d
MW-45i
MW-46s
MW-47s
MW-49s
MW-48s
MW-50s
MW-51s
MW-52s
MW-53s
MW-Js
MW-Is
MW-23d
EW-1s
MW-Ni
MW-5s
EW-25s
EW-17s
EW-5s
EW-18s
EW-8s
MW-2s
MW-3s
MW-Os
PW-2d
PW-1d
MW-As
MW-32i
EW-12s
MW-36s
MW-36i
MW-36d
MW-37d
MW-37i
MW-37s
MW-38i
MW-38s
MW-38d
MW-39s
MW-39i
MW-39d
EW-23s
EW-15s
EW-9s
EW-10s
EW-19s
EW-22s
MW-18s
MW-Ds
MW-Gs
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LEGEND

- WELL LOCATIONS
- BORE HOLE
- RAILROAD TRACKS
- PROPERTY LINE
- BARRIER WALL

SCALE IN FEET: 0 150 300

ecology and environment, inc.
International Specialists in the Environment
Portland, Oregon

DESIGNED BY:

CHECKED BY:

DRAWN BY: E. YAO

APPROVED BY

NO.	DATE	DWN	APP'D	DESCRIPTION
				REVISIONS

Figure 1

MONITORING WELL LOCATIONS

McCORMICK AND BAXTER CREOSOTING COMPANY

SCALE	DATE ISSUED	CAD FILE NO.	FIGURE NO.
NOTED	10-01-04	figure1.dwg	1

BRG PLOTTED: 10-01-04

LEGEND

- WELL LOCATION
- WELL DESIGNATED WITH MEASURABLE LNAPL
- WELL DESIGNATED WITH MEASURABLE DNAPL
- WELL DESIGNATED WITH DNAPL AND LNAPL
- GROUNDWATER CONTOUR LINE
- RAILROAD TRACKS
- PROPERTY LINE
- BARRIER WALL
- SEEP LOCATION
- HORIZONTAL GRADIENT

Note: Static water levels taken between 10:30 AM and 12:30 PM.

Willamette river average elevation is 2.91 NGVD between 10:30 AM and 12:30 PM on 09–23–04.

Willamette river at low tide minimum elevation on 09–23–04 is 2.74 NGVD at 11:00 AM.

The following wells that contain LNAPL are also included in the groundwater contour information on this map : EW-17s, EW-1s, MW-20i, EW-18s, EW-15s, EW-10s, EW-23s, MW-56s, MW-Es, MW-Gs, EW-2s, MW-Ds, MW-Rs.
The difference in depth from the LNAPL to the static water level in MW-Ds, MW-20i and EW-1s is no greater than 0.01 feet, which is the level of error attributed to the measuring instrument. Due to the small difference, it is assumed that the water level is not strongly affected by the LNAPL, and that the water level in the wells is very close to the water table surrounding the wells. For this reason no additional adjustments have been made. For EW-18s, EW-15s, EW-10s, EW-23s, MW-56s, MW-Es, EW-2s, EW-17s, MW-Rs and MW-Gs a correction for the depression of the LNAPL/water interface was applied.

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SCALE IN FEET
0 150 300

NO.	DATE	BWN	APP'D	DESCRIPTION
				REVISIONS

ecology and environment, inc.
International Specialists in the Environment
Portland, Oregon

DESIGNED BY:
CHECKED BY: E. HALE
DRAWN BY: E. YAO
APPROVED BY

Figure 2a

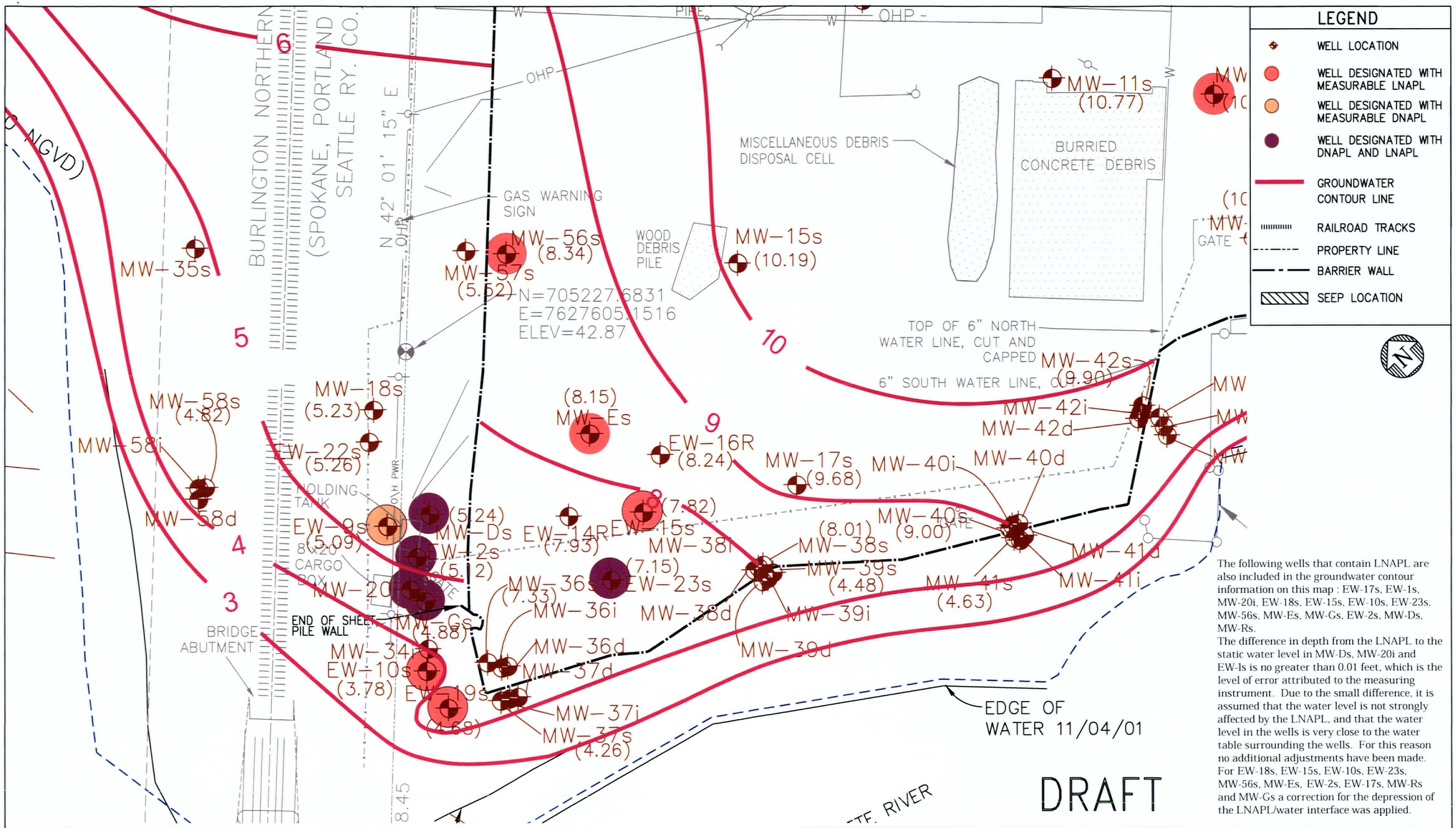
Monitoring Wells With NAPL Present and Groundwater Contours at Low Tide

McCORMICK AND BAXTER CREOSOTING COMPANY

September 23, 2004

SCALE	DATE ISSUED	CAD FILE NO.	FIGURE NO.
NOTED	10-04-04	figure2a.dwg	1

BRG PLOTTED: 10-04-04



Note: Static water levels taken between 10:30 AM and 12:30 PM.

Willamette river average elevation is 2.91 NGVD between 10:30 AM and 12:30 PM on 09-23-04.

Willamette river at low tide minimum elevation on 09-23-04 is 2.74 NGVD at 11:00 AM.

The following wells that contain LNAPL are also included in the groundwater contour information on this map : EW-17s, EW-1s, MW-20i, EW-18s, EW-15s, EW-10s, EW-23s, MW-56s, MW-Es, MW-Gs, EW-2s, MW-Ds, MW-Rs.
The difference in depth from the LNAPL to the static water level in MW-Ds, MW-20i and EW-Is is no greater than 0.01 feet, which is the level of error attributed to the measuring instrument. Due to the small difference, it is assumed that the water level is not strongly affected by the LNAPL, and that the water level in the wells is very close to the water table surrounding the wells. For this reason no additional adjustments have been made. For EW-18s, EW-15s, EW-10s, EW-23s, MW-56s, MW-Es, EW-2s, EW-17s, MW-Rs and MW-Gs a correction for the depression of the LNAPL/water interface was applied.

SCALE IN FEET
0 50 100

NO.	DATE	BY/N	APP'D	DESCRIPTION
				REVISIONS

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International Specialists in the Environment
Portland, Oregon

DESIGNED BY:
CHECKED BY: E. HALE
DRAWN BY: E. YAO
APPROVED BY

Figure 2b
Monitoring Wells With NAPL Present and Groundwater Contours at Low Tide FWDA Area

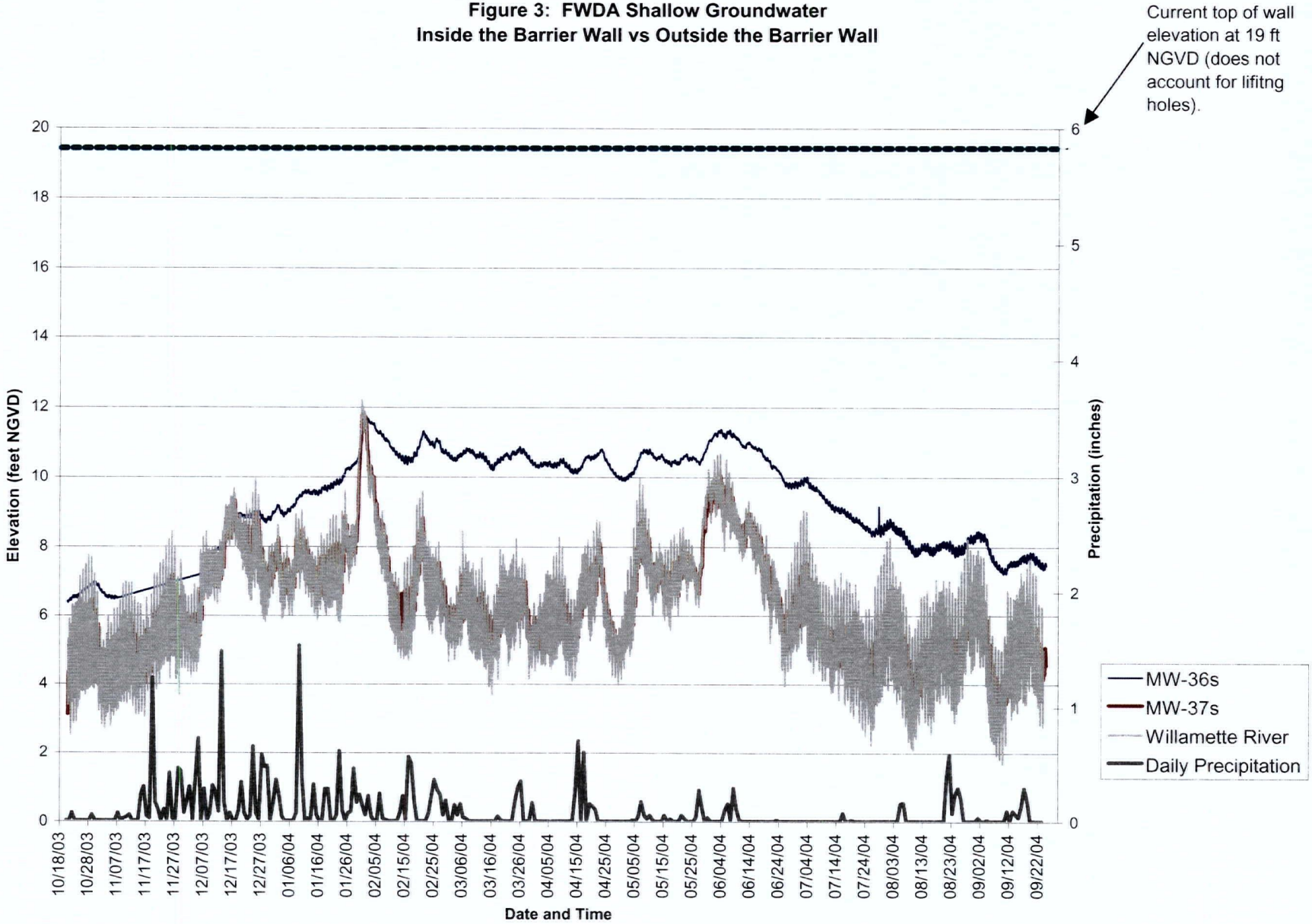
McCORMICK AND BAXTER CREOSOTING COMPANY

September 23, 2004

SCALE	DATE ISSUED	CAD FILE NO.	FIGURE NO.
NOTED	10-04-04	figure2a.dwg	1

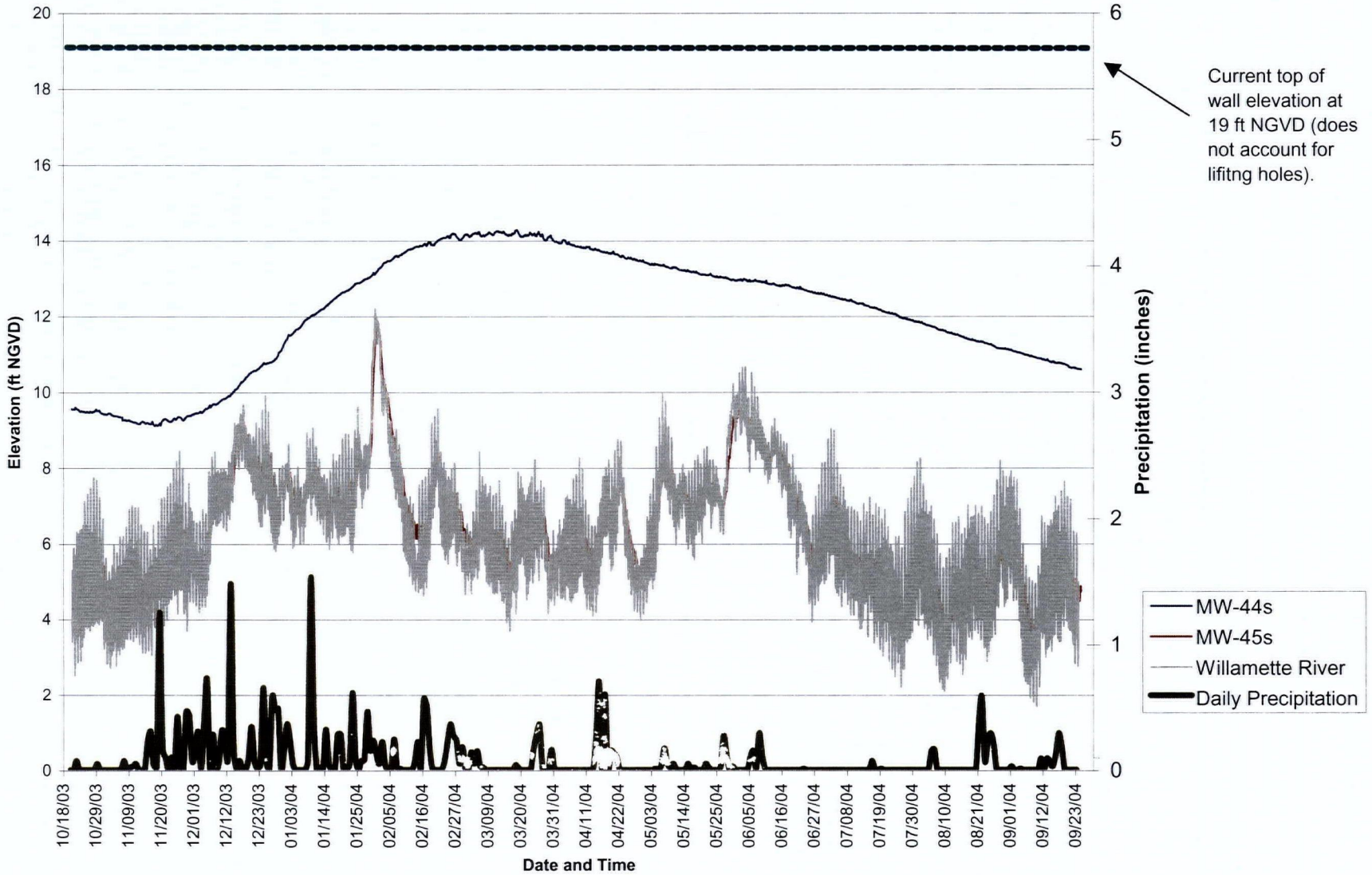
BRG PLOTTED: 10-04-04

Figure 3: FWDA Shallow Groundwater
Inside the Barrier Wall vs Outside the Barrier Wall



*Note: Precipitation data presented in this graph is obtained from the City of Portland HYDRA Rainfall Network, Swan Island raingage at http://oregon.usgs.gov/non-usgs/bes/

Figure 4: TFA Shallow Groundwater
Inside the Barrier Wall vs. Outside the Barrier Wall



Notes: Precipitation data presented in this graph is obtained from the City of Portland HYDRA Rainfall Network, Swan Island raingage, at http://oregon.usgs.gov/non-usgs/bes/